

# MORPHOLOGICAL STUDIES ON THE SYCONIA OF *FICUS BENGALENSIS* LINN.<sup>1</sup>

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AND

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(With four text figures)

The morphology of the syconia of *Ficus bengalensis* collected during July and November has been studied. There are male, female and gall flowers in syconia of both months but in July syconia two types of gall flowers are observed. The first type of gall flowers are smaller and enclose species of *Blastophaga*, while the second type are larger and enclose wasps which resembled species of *Apocrypta*. Unlike other species, the male flowers are not restricted to the proximity of the ostiole but are found here and there throughout the floor of the syconium. The results are discussed in relation to the previous observations on other species of figs.

## INTRODUCTION

The genus *Ficus*, commonly known as the Fig, is characterised by the specialised type of inflorescence called Syconium (or Hypanthodium) which develops into a compound fruit. Because of their peculiar morphology, the syconia of figs have attracted the attention of a number of researchers who have studied their constitution, development and pollination biology (Galil and Eisikowitch 1968a, 1968b, 1969, 1974 and Galil and Yehudit Snitzer Pasternak 1970, Johri and Konar 1955, 1956). Special attention has been paid especially to the pollination biology of the figs and their pollinating insects like species of *Apocrypta*, *Blastophaga* and *Sycophaga*. A careful review of the previous literature indicates that not much work has been done on *Ficus*

*bengalensis* L. which is a common species in India.

There also exists a lot of variations and confusions regarding the occurrence, location and distribution of the male, female, neutral and gall flowers in the syconia collected at different periods of the year. The object of the present study is to investigate the morphology of syconia and its constituent flowers in *Ficus bengalensis*.

## OBSERVATIONS

The sessile syconia occur in pairs in the axils of leaves. There are 3 rounded bracts which become quite prominent and spreading at the base of each syconium and these bracts are glabrous, coriaceous at the maturity of syconia. The syconia when very young are green but change to orange colour after a long time only to become red at maturity. The mature fruits range from 17-20 mm in diameter. There is also a change in shape of the inflorescence from the triangular to the rounded shape during development.

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*Ostiole* : Each syconium has an ostiole at its free end (Fig. 2D). Its position could be made out as a circular mark. But the opening becomes very conspicuous only during the ripening of the syconia, not only by an increase in its diameter but also by its rising above the surface of the syconia. The ostiole is lined internally by scales of different types.

There are about 10-14 hard triangular scales with rounded bases nearer towards the outer opening of the ostiole and these scales are so closely arranged that nothing could find its way out. But with the enlargement of the syconia these scales loosen to make an opening. These scales have their epidermal cells in the upper part drawn out into small elongated hair like structures whereas the basal part is devoid of these structures (Fig. 1A). Away from the external opening of the ostiole, are elongated hard scales which form the second category (Fig. 1B).

*Flowers* : The syconia consist of male, female and gall flowers. Of the two crops

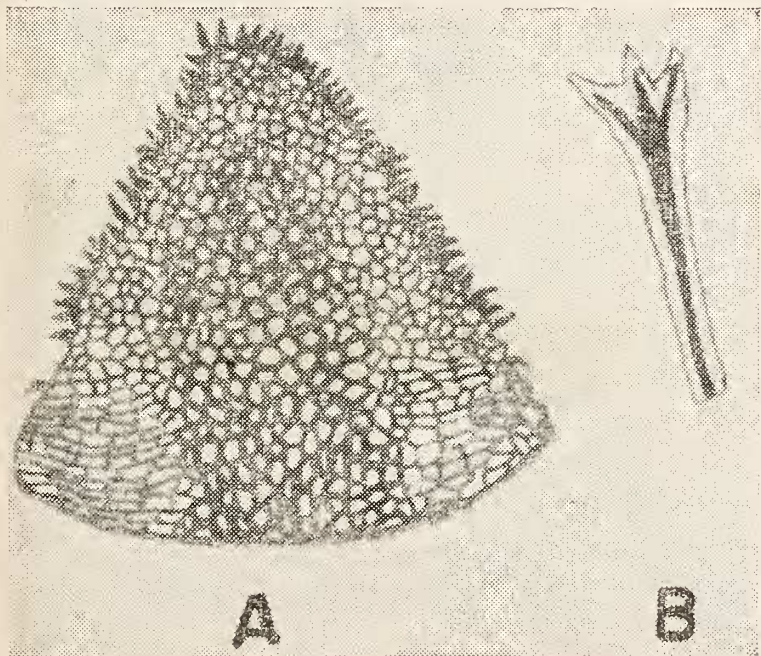


Fig. 1. A — Triangular scale found at the ostiolar region. B — Scale found away from the external opening of the ostiole.

of syconia collected, one in November and the other in July, we could observe two differences: (1) the number of male flowers in the syconia collected in November is slightly more than that of the other. (2) In the syconia collected in July a few quite unusually large gall flowers along with the other usual type of flowers are observed.

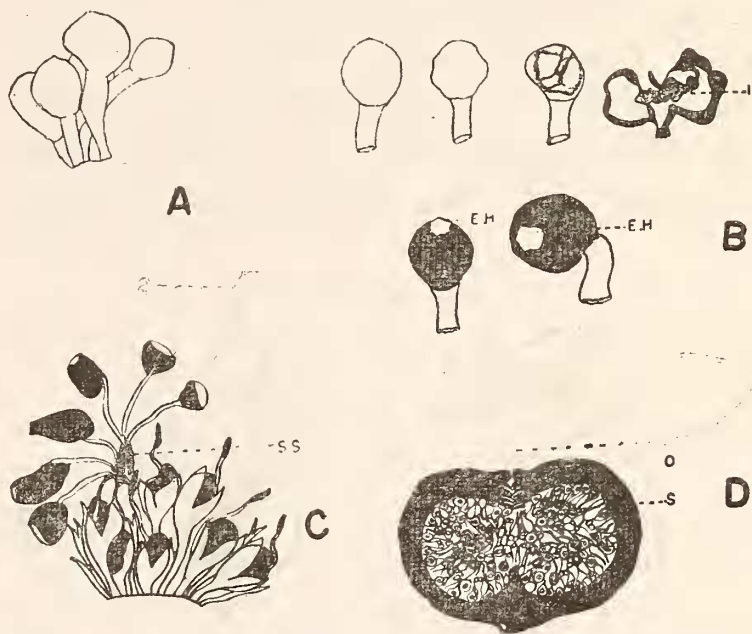


Fig. 2. A— Group of exceptionally large gall flowers. B — Stages in the development of exceptionally large gall flowers.

*Abbreviations*: E. H. — Exit hole, I — Insect. C — A group of female flowers forming Synstigma (SS). D — L.S. of Syconium. O — Ostiole, S — Staminate flower.

(a) *Male flowers* : Male flowers are distributed here and there throughout the floor of the syconia (Fig. 2D). The number of male flowers per syconium is considerably less when compared to that of the female and gall flowers. All the male flowers are more or less of the same size. Each flower is bracteate and pedicellate, the pedicel being very long. Three perianth lobes arise at the end of the pedicel, enclosing the single stamen (Fig. 3A). The perianth is polyphylous with imbricate aestivation. Each flower has a short, thick filament dilated at the apex

where the ditheous anther is embedded along its vertical thecae. The anthers open by longitudinal slits.

(b) *Female flowers*: The female flowers are of the following types: (1) Nearly half the number of female flowers of the syconium are sessile or almost sessile, with comparatively long styles (Fig. 3B). All these flowers are well developed. The length of the style varies from 2-3 mm. These flowers are bracteate with 3 polyphyllous and imbricate perianth enclosing the ovary at its base. Style is lateral. (2) The second type of flowers

are pedicellate and have comparatively shorter styles (0.5-1 mm), (Fig. 3C, D). All intermediate forms with respect to style length are found. All these flowers have the same number of free perianth lobes enclosing ovaries with lateral styles. In this second category a few flowers are underdeveloped. These flowers in whose ovary parts the insects lay their eggs, hatch and develop into adults which escape through apical pores made by them on the ovary. As these different types of female flowers intermingle, the styles of these flowers become interlaced and stuck together, especially at their stigmatic level forming a compound or syn-stigma (Fig. 2C).

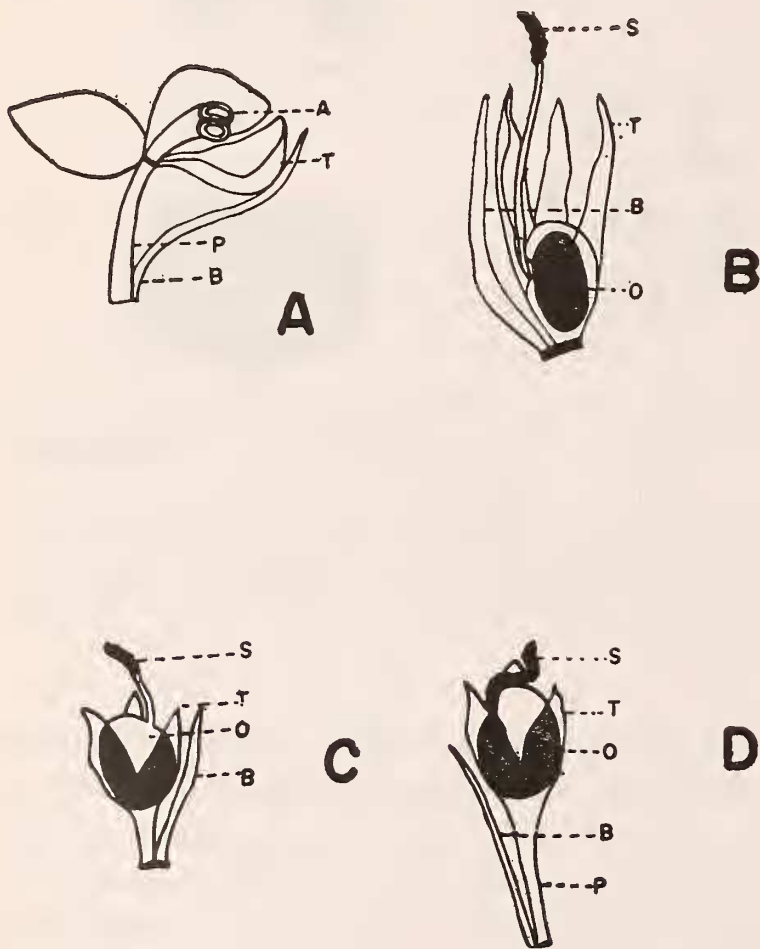


Fig. 3. A — Staminate flower.

Abbreviations: A — Anther, B — Bract, P — Pedicel, T — Tepal.

B — Sessile and long styled female flower.

Abbreviations: B — Bract, O — Ovule, S — Stigma, T — Tepal.

C & D. — Pedicellate and short styled flower.

Abbreviations: B — Bract, O — Ovule, P — Pedicel, S — Stigma, T — Tepal.

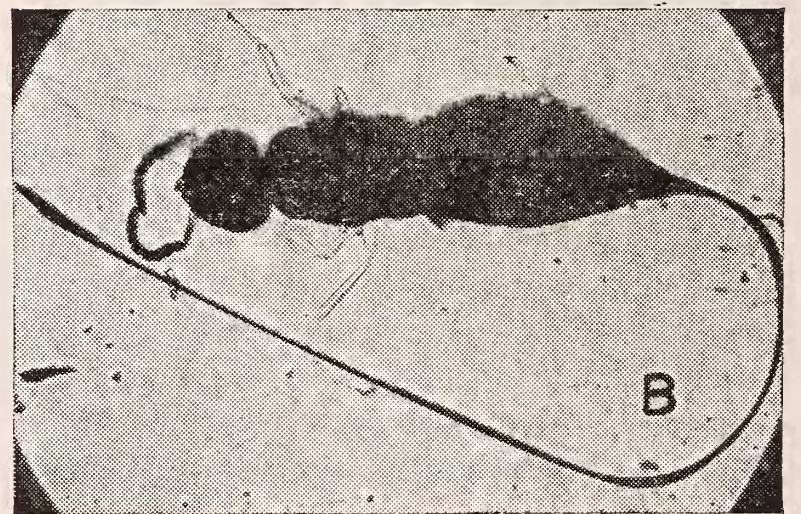


Fig. 4. A — *Blastophaga quadruticeps* — Adult insect. B — *Apocrypta* sp. — Adult insect.

(c) *Unusually large gall flowers* : In syconia collected in July a variable number of large, very distinct gall flowers are found in addition to the usual sized gall flowers (Fig. 2A). They are without perianth and largely distinct from other flowers in having a more or less spherical upper part borne on a hard stalk. The hardness is evident in such flowers even at younger stages of development. As they develop (Fig. 2B), their colour changes from whitish to pale brownish and the outer surface of the flowers becomes slightly crinkled. They all enclose insects which at maturation escape out through an opening, much in the same way as in the other type of gall flowers. After the insect leaves the flowers, the flower becomes still harder and the colour becomes dark brown (Fig. 2B).

*Gall insects* : The insects collected from the syconia were found to be of two different types. One type of insect resembles *Blastophaga quadruticeps* (Fig. 4A) where sexual dimorphism is exhibited. The males are wingless whereas the females are winged with a long filament at the posterior end. The other insect resembles the species of the genus *Apocrypta* (Fig. 4B) whose males do not have the filament. Careful studies indicate that the unusually large sized gall flowers harbour the metamorphic stages of *Apocrypta* while the other type of gall flowers seem to have *Blastophaga*.

#### DISCUSSION

The distribution of male flowers in the syconium has been a matter of discussion in the past literature. In *Ficus religiosa* investigated by Johri and Konar (1955, 1956) there are 11-19 male flowers distributed nearer to the ostiole region of the syconium. In syconia of the same species (Galil & Eisikowitch

1968a), collected at Israel, there are only 9-12 male flowers, but their distribution is the same as in Indian syconia recorded by Johri and Konar (1956). In *Ficus syconiosus* also the male flowers are distributed nearer to the ostiole (Galil & Eisikowitch 1968b). In the syconia of *F. bengalensis* investigated at present, the male flowers are scattered throughout the floor of the syconium and are not restricted to the ostiolar proximity. This is true of syconia collected both during July and November. In November syconia there are more number of male flowers than in July syconia.

The present study is able to confirm the presence of different types of female flowers within the same syconium recorded earlier for other species of *Ficus*. The sessile long styled ones form the one extreme and the pedicelled short styled ones form the other extreme. All intergrades in stylar length could be observed. The present study confirms the earlier observations on other species that the long styled sessile flowers are generally the seed flowers while the pedicellate short styled ones invariably develop into gall flowers. The occasional development of short styled ones into fruiting stage and the long styled ones into gall flowers, indicates that there is no fundamental distinction between female and gall flowers, a fact already stressed by Johri and Konar (1956), and Galil and Eisikowitch (1968b) for other species.

The presence of two types of gall flowers is a significant point of discussion. One type of gall flower is found both in the July and November syconia, while the other is observed only in July syconia. The latter type is unusually large, whitish to start with but becoming brownish at maturity, has fairly long and thick pedicels, perianth lobes could not be detected in it. It also contains different

type of gall wasp resembling the genus *Apocrypta* while the other type of gall flower encloses *Blastophaga* species. Although the presence of more than a single gall wasp in the syconium of a few other species (see Galil and Eisikowitch 1968a) is recorded, as far as we are aware of, it has not been recorded in *F. bengalensis*. This complicates the polli-

nation ecology of this species.

#### ACKNOWLEDGEMENT

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